ANALYSIS OF INTRASPECIFIC VARIATION IN LOPHOPODELLA CARTERI (HYATT) FROM THE TAXONOMICAL VIEW-POINT X. FURTHER OBSERVATIONS ON THE RELATION BETWEEN THE NUMBER OF TENTACLES OF THE POLYPIDES AND THE NUMBER OF SPINES ON THE SPINOBLAST

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ANALYSIS OF INTRASPECIFIC VARIATION IN *LOPHOPODELLA CARTERI* (HYATT) FROM THE TAXONOMICAL VIEW-POINT

X. FURTHER OBSERVATIONS ON THE RELATION BETWEEN THE NUMBER OF TENTACLES OF THE POLYPIDES AND THE NUMBER OF SPINES ON THE SPINOBLAST[1)]

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1. INTRODUCTION

The relation between the number of tentacles and the spines of the spinoblasts was observed by the writer in 1964 (Report VII). The results of observations showed that the intraspecific groups could be distinguished by this relation. The results obtained at that time were;

(1) When one material was reared for a long period in the laboratory, both tentacles and spines varied in number seasonally.
(2) A high correlation was recognized between the variations of the two features in the group of colonies originating from one colony. The polypides with a large tentacle number produced spinoblasts with large spine number.
(3) The materials from different localities which had large tentacle number did not always produce the spinoblasts with large spine number.

From these results, it appeared likely that in material originating from one colony these two features always vary in the same way. However, those observations were made to distinguish the various intraspecific groups rather than to observe the relation between the two features. They were made under the following conditions: –

(1) The room temperature was varied by season.
(2) The vessels used were similar in size.
(3) The other rearing methods were similar through out the year.

1) Contributions from the Marine Biological Station of Asamushi, Aomori Ken, No. 338

As already mentioned in Report IX, the tentacle number was influenced by the volume of water in the vessel, but the spine number was not so heavily influenced as the tentacle number. This suggests that under different rearing conditions, the parallelism between the two features is not always seen. It seems that observations on the relation between the environmental conditions and these two features are very important for an analysis of the different intraspecific groups. The writer made observations on this problem and obtained the results described below.

2. THE RELATION BETWEEN THE NUMBERS OF TENTACLES AND SPINES AT DIFFERENT TEMPERATURES

In Observation 1 of the previous report, the two features showed the following numerical values.

Date examined	Material	Temperature	Tentacles	Spines
IV, 1st,	Saijô II	22°C	72.5	7.2
		30°	68.5	6.3
IV, 11th	Saijô II	22°	73.3	6.9
		30°	67.3	6.3
IV, 11th	Yohei-numa	22°	76.4	10.1
		30°	72.9	9.0
IV, 28th	Yohei-numa	22°	76.6	11.8
		30°	72.7	8.7

The tentacles and the spines decreased in number at high water temperatures. In Observation 2, the tentacles decreased in number at 13°C, but the spines increased in number.

Temperature	Tentacles	Spines
13°C	63.0	12.1
22°	70.3	7.2

This relationship was also found in Observation 3 as shown in the table. The spine number was largest at a low temperature of 13°C, but the tentacles decreased in number at this temperature.

Temperature	Tentacles	Spines
13°C	60.0	9.2
22°	67.5	7.2
30°	66.1	6.2

Thus the two features differed in their response to temperature.

3. COMPARISON BETWEEN MATERIAL COLLECTED IN THE FIELD AND THAT REARED IN THE LABORATORY

In the previous report, the tentacles decreased in number when the field material was reared in the laboratory. If the parallelism is always present between the variations of the two features, the spines should also decrease in number in the laboratory. In the reared and the field materials from Higashi Sendai, the two features varied independently (Fig. 1), although parallelism was seen in the reared materials.

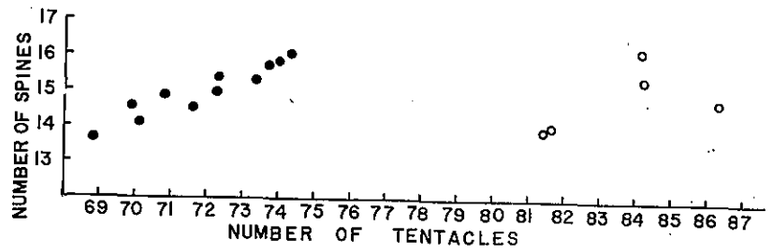

Fig. 1. Correlation between the two features
●—reared material ○—field material

4. THE INFLUENCE OF WATER VOLUME

1) The materials originating from one colony showed no difference in the two features when they were reared in the laboratory (Report II, pp. 135–139, Figs. 1–2, Report VI, p. 16, Figs. 5–6). For example, the result using materials from the reservoir Himeji No. 36 is shown below.

Date examined	Generation	Tentacles		Spines	
		No. 1	No. 2	No. 1	No. 2
X, 17th, '53	1st	79.0	79.4	5.4	5.5
XI, 20th	2nd	81.4	81.1	5.9	5.9
I, 9th, '55	3rd	72.5	72.4	7.1	6.7
III, 5th	4th	77.0	76.4	5.6	5.7
IX, 2nd		74.6	75.3	4.7	4.7
I. 3rd, '56		76.7	76.0	8.1	7.8

In materials originating from one colony from Saijô II, the two features varied as follows, when they were reared at the same time.

Material	Tentacles	Spines
A	70.1	7.4
B	70.8	7.4
C	70.9	7.3
D	70.2	7.4
E	71.1	7.4
F	72.8	7.2

Except for F, the polypides were almost similar in number (63–78). It is a noteworthy fact that the variations of the two features are within a narrow range, when they are reared in the vessels of similar size. Therefore, it may be said that the materials originating from one colony show no difference in the two features when the volume of water for each polypide is similar.

2) (a) The materials originating from one colony were reared in different size vessels in Hiroshima. The spines varied in number independently of the number of tentacles (Fig. 2), although a high correlation was recognized between the two features in one vessel.

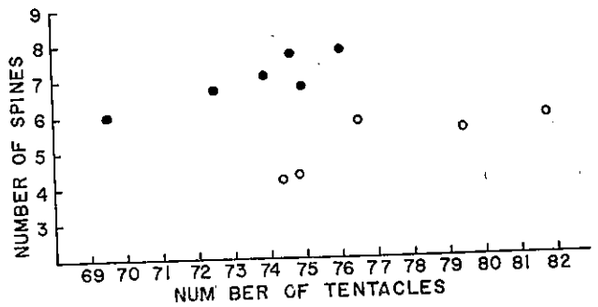

Fig. 2. Correlation between the two features.
●–material reared in small vessel ○–material reared in large vessel

The tentacle number of the material in the large vessel is larger than that in the small vessel, but the spine number is smaller.

(b) In Observation 5 of Report IX, the relation of the two features was;

Date examined	Vessel	Tentacles	Variation range of mean in 75% reliability	Spines	Variation range of mean in 75% reliability
XII, 27th 1964	Small	72.0	71.5-72.5	8.0	7.7-8.2
	Large	76.1	75.6-76.7	7.8	7.6-8.0
I, 22nd 1965	Small	72.7	71.4-74.0	7.6	—
	Large	74.5	74.3-75.1	7.3	7.0-7.6
IV, 1st, 1965	Small	69.9	69.1-70.7	7.5	—
	Large	72.4	71.8-73.1	7.5	—

A marked difference is seen in the tentacle number but the spines show no difference in number.

In Observations 6 and 7 of Report IX, the vessels used were equal in size but the polypides differed in number. In these observations, therefore, the volume of water for a polypide differed in the different vessels.

Original number of Colonies	Number of colonies on II, 10th	Total number of polypides	Tentacles	Spines
1	2	36	75.9	7.8
1	3	47	75.7	8.1
1	3	48	75.7	7.8
1	4	51	74.0	7.3
9	9	66	73.3	7.5
9	9	78	72.4	7.8

Number of ancestrulae	Total number of polypides	Tentacles	Spines
1	43	71.4	7.8
1	44	72.3	7.6
1	48	69.6	7.4
1	50	71.2	7.9
3	55	70.2	7.8
5	62	68.1	7.3
5	68	68.3	7.6
7	85	67.4	7.7

As seen in these tables, the tentacles vary in number with variations in the volume of water but the spine number is not influenced by volume of water.

5. THE INFLUENCE OF DIFFERENT DIETS

The two materials reared in different vessels showed a marked difference in their tentacle number in spite of the fact that they were reared at a constant temperature of 25°C. (Report VI, p. 15, Fig. 3). In the pond water, the tentacles were numerous in comparison with the other, but the spines were fewer as shown in the following table.

Date examined	Water	Tentacles			Spines		
		Mean	Variation range of mean in 75% reliability	Number of readings	Mean	Variation range of mean in 75% reliability	Number of readings
IX, 18th, 1953	Pond	78.0	77.8-78.3	50	4.9	4.7-5.0	268
	Tank	75.5	75.3-75.7	50	5.7	5.5-5.8	68
X, 17th, 1953	Pond	79.4	78.5-80.3	50	5.5	5.4-5.6	228
	Tank	76.1	75.6-76.7	50	6.1	6.0-6.3	248

The two kinds of waters differed in the food they contained (Report I, p. 67). In this observation, however, it cannot be said that the difference of the tentacle number was influenced only by the kind of diet. Because the diet which was composed of flagellates and other organisms in the tank water, was not as abundant as in the other water, and the quantity of diet might affect the variation of tentacle number in the laboratory. But, it may be said that there was no relation between

the variation in the number of spines and that of the tentacles. A similar result was obtained from the following observation.

Observation.

Material: – The colonies from the reservoir Saijô II

Vessels used: – 7.5 cm in diameter, 6.0 cm in height

Method: – One colony was divided into three pieces, and they were reared in three vessels at 22°C. In A and B, the water was renewed once a day with pipe water from the private waterworks of the laboratory, and about 2 cc of culture solution containing protozoans was added. Sample C was reared in pond water.

Diets: – A – *Paramecium caudatum*

B – *Chilomonas paramecium*, *Colpidium colpoda* and some minute flagellates

C – *Cryptomonas* sp. *Chlamydomonas* sp., *Euglena* spp. etc..

Result: – The numbers of tentacles and spines are as follows;

Date examined	Group	Kind of diet	Number of colonies	Total number of polypides	Tentacles	Spines
V, 10th, 1965	A	*P. caudatum*	2	102	74.0	7.4
	A	〃	2	114	74.6	7.6
	B	*Ch. paramecium* *Co. colpoda* etc.	2	49	76.1	7.8
	B	〃	2	58	76.7	8.2
	C	*Cryptomonas* sp. etc.	3	34	71.8	8.5
V, 17th, 1965	A		2	70	74.0	7.0
	B		2	66	75.0	8.2

As seen in this table, the two features varied with variation in the diet. In group C, the tentacles were fewest but the spines were most numerous. Group A had more numerous tentacles and spines than group B. Therefore, it may be said that the polypides with numerous tentacles do not always produce spinoblasts with numerous spines.

In this observation the amount of food available was different in the three vessels. In group A there were more Paramecia compared with the other vessels. It seems that the difference in number of polypides was the result of the differing amounts of food available.

It may be concluded that under the conditions reported in a previous paper (Report VII) the two features vary in a parallel manner, but under other conditions the variation of the number of tentacles and spines is not parallel.

SUMMARY

1. At a low temperature of 13°C, the number of tentacles decreased but the spines increased in number.

2. When the field material was reared in the laboratory, the decrease in tentacle number bore no relation to that of the spines.

3. The number of tentacles was influenced by the volume of water, but the variation of spine number was not so distinctly influenced.

4. When the material was reared on different diets, parallelism was not always recognized between the two features.

LITERATURE

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